Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

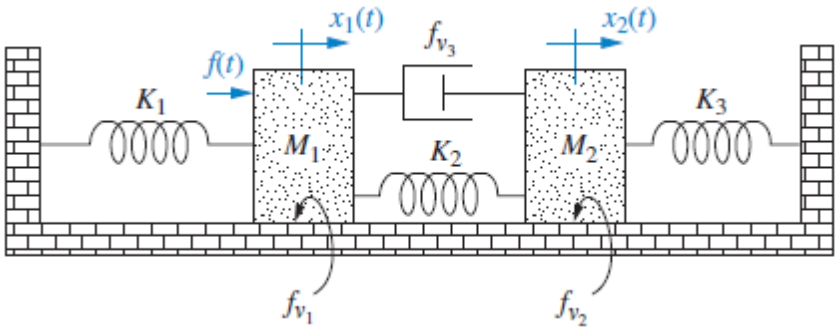
Programme Name: M.Tech/ ES+REE **Semester : I**
Course Name : Instrumentation control & Automation **Time : 03 hrs.**
Course Code : EPEC7003 **Max. Marks : 100**
Nos. of page(s) : 3
Instructions: Attempt all the questions.

SECTION A

S. No.		Marks	CO
Q 1	Describe the dynamic response of a PMMC galvanometer. Discus the damping and find the requirements for critical damping.	**5**	**CO2**
Q 2	Define the following: 1. Accuracy and Precision 2. Transducer and Sensors 3. Threshold 4. Loading Effect 5. Piezo Electric effect	**5**	**CO1**
Q 3	List the devices available to interface with the computer in order to acquire the data for controlling the process. Mention their individual advantages, disadvantages and applications.	5	**CO1 CO2**
Q 4	Draw the block diagram of closed loop control using PID Controller, mention each component and explain the controller in brief.	5	**CO3**

SECTION B

Q 5	1. What are thermistors? How they are constructed? Discuss their resistance-temperature characteristics. 2. For a certain thermistor β=3100 K and its resistance at 20^0 C is known to be 1050 Ω. The thermistor is used for the temperature measurement and the resistance measured is 2300 Ω. Find the measured temperature.	(6+4)	**CO1, CO2**
Q 6	1. An electrical resistance strain gauge of resistance 120 Ω has a gauge factor of 2. It is bonded to a steel specimen (modulus of elasticity, $E=2x10^6$ N/m^2) for measuring strain. Estimate the following. a) Strain induced in the specimen if a tensile stress of $60x10^6$ N/m^2 is applied on the specimen.	(3+3+4)	**CO1, CO2**

	b) Change in the electrical resistance of the gauge due to the tensile stress as given in above case. c) Change in the electrical resistance of the gauge if there is an increase of temperature by 40^0 C. Assume the following data: Temperature coefficient of resistance of the gauge= 20 x 10^{-6} per ^{0}C. Thermal coefficient of linear expansion of the gauge= 16 x 10^{-6} per ^{0}C. Thermal coefficient of resistance of the gauge= 12 x 10^{-6} per ^{0}C.		
Q 7	1. For the system shown below in Fig:1 find the transfer function $X_2(s)/F(s)$.  Fig:1 2. Write the dynamical equation in F-V and F-I analogy and draw the analogous circuits for the system shown in Fig:1.	(6+4)	**CO3**
Q 8	1. Describe the working principle and construction of electrodynamometer type wattmeter. Draw the connection diagrams. 2. Describe the measurement of power in single-phase AC circuits by following methods. i. Three Voltmeter Method ii. Three Ammeter method	10	**CO1, CO2**
SECTION-C			
Q 9	1. Discuss the importance of SCADA in automation. Explain the architecture in detail with proper example. List and describe the major areas in which SCADA finds the application. 2. Define the data acquisition system. Draw its block diagram and mention the objectives of data acquisition system.	(14+6)	**CO4, CO5**

Q10	1. When a Car enters the hall, a certain sequence is to be followed automatically. Steps are, 1) Soaping, 2) Washing, 3) Rinsing and 4) Drying. Implement this process sequence in PLC using Ladder Diagram programming language. 2. Describe the architecture of PLCs. Mention the inputs and outputs of a PLC and list the applications **OR** 1. A classroom has a capacity of maximum 120 students. There are two doors, one for Entry and the other for Exit. When number of students in the classroom is less than 120, Entry door has a Green light on it, which remains ON. When number of students in the classroom is 120 or more than that, Red light goes ON turning OFF the Green light, which indicates that the classroom has reached its maximum capacity, and is full. Implement the scenario using PLC ladder logic diagrams. 2. Describe the PLC operation and mention how PLC is different from distributed control systems.	(10+10)	**CO4, CO5**